Ocean Mist Farms

Labor-Intensive U.S. Fruit and Vegetable Industry Competes in a Global Market

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- The U.S. fruit and vegetable industry is labor intensive, pays higher wages than are paid in many other countries, and increasingly operates in a global economy.
- U.S. fruit and vegetable farms rely on seasonal workers who are likely to be unauthorized immigrants; any future immigration reform could reduce the supply of labor or raise wages.
- Fruit and vegetable growers may respond to any potential wage increases by reducing the number of seasonal workers employed, adopting mechanized harvesters or other labor-saving technologies in the field, or reducing production.

U.S. fruit and vegetable producers have reason to be concerned about the cost and availability of labor to harvest their crops. For most crops, a harvest delayed by lack of labor means less profit for growers because even a short delay can reduce quality and price. Longer delays may mean that the entire crop is lost if the quality deteriorates to the point that it cannot be marketed. Growers' competitiveness is affected by wage rates. In 2010, the Federal minimum wage is $7.25 per *hour* ($8.00 per hour in California), while the minimum wage in Mexico ranges from $4.17 to $4.40 per *day*, depending on the region.

Any potential immigration reform could have significant impacts on the U.S. fruit and vegetable industry. Over half of hired workers employed in U.S. crop agriculture are believed to be unauthorized immigrants, and experience has shown that most will move on to nonagricultural employment within a decade of beginning to work in the fields. Relatively low wages compared with other U.S. jobs, hard physical labor, frequent harsh weather conditions, and seasonal employment patterns make working on crop farms unappealing to most U.S. citizens and authorized immigrants.

The supply of farmworkers for the U.S. produce industry depends on a constant influx of new, foreign-born labor attracted by wages above those in the workers' countries of origin, primarily Mexico. Immigration policy helps to determine whether the produce industry's labor force will be authorized or unauthorized. Any debate about more stringent enforcement of current immigration and labor laws or immigration reform that could reduce the supply of workers or make agricultural labor more expensive is of interest to growers.


Washington Tree Fruit Research Commission

Hand harvesting apples . . .

. . . experimenting with a harvest platform labor aid prototype


DBR Conveyor Systems

Growers' Vulnerability to Potential Wage Increases Varies

The most recent data from ERS indicate that labor accounted for 42 percent of the variable production expenses for U.S. fruit and vegetable farms, although labor's share varied significantly depending on the characteristics of the commodity and whether the harvest was mechanized. Factors that affect grower profitability, including higher wages, will put pressure on growers to reduce labor costs, their single largest variable production expense. The response of fruit and vegetable growers to wage increases will vary depending on the commodity, import and export competition, domestic demand, availability of mechanical harvesters, and other factors.

ERS examined seven fruit and vegetable industries to look at how growers deal with labor, with a particular focus on the potential for harvest mechanization: Washington State fresh-market apples, Florida processing oranges, California fresh-market oranges and strawberries, raisins, fresh-market asparagus, and lettuce. These commodities include fresh, fresh-cut (bagged salads), and processed items (raisins and orange juice). Harvesting of all seven commodities is either exclusively done by hand or only partially mechanized. These industries vary in size. The fresh asparagus industry had an average annual farmgate value of $91 million in 2005-07. The lettuce industry is quite large, with an average annual farmgate value of $2 billion in 2005-07.

Washington State apples dominate the U.S. fresh apple market. Growers in Washington generally produce for the fresh market, and processing serves as a secondary market; any apples that do not meet the demands of the fresh market can be diverted to processing. There is limited import competition in the fresh market, but growers face competition from China in the processing market. With declining per capita fresh apple consumption, the U.S. apple industry is increasingly reliant on export markets, with 24 percent of fresh production exported in 2005-07, up 31 percent since 1990-92. While China, the world's largest apple producer, cannot export fresh apples to the United States due to phytosanitary issues, U.S. growers must compete with China in some export markets. The Washington apple industry is under considerable pressure to reduce costs, but there is no commercial mechanical harvester for apples yet.

Florida oranges are mostly processed into juice, and **California oranges** are mostly sold to the fresh market. The Florida industry has been been buffeted by hurricanes, disease, and imports from Brazil, so reducing production costs is critical. There is a mechanical harvester available for Florida growers, which shakes the tree canopy to dislodge the fruit, but less than 7 percent of the processing orange crop is harvested this way. Work is underway to make the harvester more profitable for growers to adopt. California orange growers cannot employ the mechanical harvester used in Florida because it damages the skin of the fruit, rendering it unacceptable for the fresh market. The California orange industry does not face serious import competition during the season for navel oranges, the dominant variety. U.S. fresh orange consumption has

Characteristics of the commodity industry influence the demand for mechanization

	Apples	Oranges		Raisins	Straw-berries	Aspara-gus	Lettuce
		Fresh-market	Processing				
				Million dollars			
Average value: 2005-07[1]							
Fresh	1,932	660	NA	NA	1,416	91	2,080
Processed	229	NA	1,539	355	140	16	NA
				Percent			
Import share of consumption[2]							
Fresh	8	7	NA	NA	8	76	2
Processed	81	NA	30	12	32	60	NA
Export share of fresh production[3]	24	29	14	41	12	19	6
Change in production: 1990-92 to 2005-07							
Fresh	20[4]	-4	NA	NA	81	-28	18
Processed	NA[5]	NA	1[6]	-4	NA[5]	-71	NA
Change in consumption: 1990-92 to 2005-07							
Fresh	-11	-21	NA	NA	75	91	1
Processed	32	NA	-12	-15	41	-36	NA
Change in yield: 1990-92 to 2005-07	19	-7	-7	-1	63	12	7
Mechanization	No	No	Partial	Partial	No	No	Partial[7]

NA=Not applicable.
[1]Farmgate value for all but citrus; equivalent packinghouse-door returns for citrus.
[2]Imports as a percent of consumption (production plus imports minus exports). Shares are calculated separately for fresh-market and processed-market production and trade.
[3]Exports as a percent of fresh production.
[4]Production declined 7 percent from the average of the 1998-2000 harvests.
[5]Production is used in both the fresh and processed market; all production is shown as fresh, but part is used as processed.
[6]Production declined 35 percent since the 1997/98 season.
[7]Only baby leaf lettuce is mechanized.
Source: USDA, Economic Research Service calculations based on *Fruit and Tree Nuts Yearbook* and *Vegetables and Melons Yearbook*.

Hand harvesting California fresh-market oranges . . .

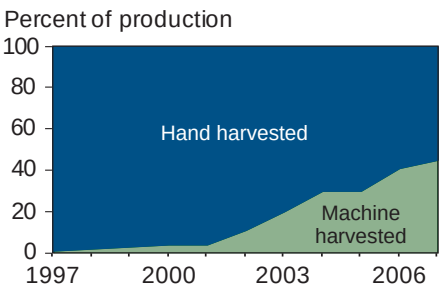
. . .machine harvesting Florida processing oranges

Oxbo International Corporation

declined, which makes the industry more reliant on export markets where China could be a major competitor. This situation could encourage growers to take a closer look at mechanical harvest options.

Raisin production and domestic consumption have declined. The U.S. industry exports almost half of the raisins it produces and faces export competition from Turkey, a low-cost supplier. U.S. raisin growers began adopting mechanical harvesters in large numbers in 2001, following a 56-percent drop in raisin prices in 2000, a tighter labor supply, and the introduction of an improved mechanical harvester. Adoption of new machinery and associated changes in how raisin grapes are produced can be expensive, making it likely that younger and larger growers may mechanize first. The raisin industry has many small producers nearing retirement age. Adopting expensive new harvest technology may not be economically viable for this group.

Mechanical harvesting of grapes for raisins grew from 1 percent to 45 percent of production between 2000 and 2007



Source: USDA, Economic Research Service from Ron Brase, California AgQuest Consulting, 2009.

Strawberries are produced year round in California. Average annual production increased 81 percent from 1990-92 to 2005-07, and per capita consumption rose 75 percent over the same period. California strawberry growers produce for the fresh market and use the processing market for berries that cannot be sold fresh.

With no significant import or export competition in the fresh market, strawberry growers are in a better position than other fruit and vegetable growers to pass some increases in labor costs along to consumers. But growers are facing import competition in the processing market, which creates pressure to reduce costs.

Strawberries may be one of the most difficult crops to mechanize; there is no commercial mechanical harvester available currently. Some growers are using a labor aid to boost labor productivity in the fields—a conveyor belt that moves slowly down the field just ahead of the workers to provide a platform where workers can place their full flats of berries instead of carrying the flats to trucks at the edge of the field.

California Raisin Marketing Board

Hand harvesting raisin grapes and placing them on paper trays to dry in the sun. . .

. . . machines doing the same work

Stephen Vasquez

Hand harvesting strawberries . . .

. . . hand harvesting strawberries with a conveyor belt labor aid

Asparagus growers face intense import competition. Fresh asparagus imports accounted for 76 percent of average annual domestic fresh consumption in 2005-07, and this share is likely to continue increasing. With increasing imports, U.S. average annual production (fresh and processed) decreased 46 percent between 1990-92 and 2005-07. A prototype mechanical harvester is being tested but, in the meantime, growers may further reduce plantings.

Lettuce production is concentrated in California during the spring to fall seasons, with both California and Arizona supplying lettuce during the winter season. U.S. imports of lettuce are small, and export competition is not a concern. Baby leaf lettuce is mostly mechanically harvested, and it is unlikely the industry could have grown so rapidly without mechanization. The rest of the lettuce industry still uses hand harvesting. If wages rose, lettuce growers could probably pass on some increases in labor costs to consumers. Many firms are currently engaged in research on mechanical lettuce harvesters.

Growers May Use Many Strategies To Adapt to Rising Wages

Labor is just one input in a complex production process, and growers have several options if wages rise. For example, growers may use less labor if the wage rate increases. Asparagus is typically harvested continuously over several months. If the price of asparagus is too low relative to labor costs, growers may stop harvesting a field, trading off the loss of income from reduced yields against the savings on labor costs.

Growers also may combat rising labor costs by using more labor aids to improve labor efficiency, such as replacing ladders with mobile platforms in apple orchards when pruning and thinning trees. Experts are developing platforms that are stable enough to support workers and apples during harvesting activities. If these efforts are successful, platforms could replace ladders and lead to improvements in productivity. Studies show that workers spend only 30 percent of their time picking apples; the rest is spent positioning and climbing ladders and unloading bags of fruit.

Growers may mechanize to replace costly labor *if* an economical mechanical alternative is available. However, mechanization often presents complex technical challenges. A machine cannot easily mimic the judgment and dexterity of experienced farmworkers, particularly when crops do not mature evenly, and workers must determine what can be harvested during multiple passes through fields and orchards. Research and development (R&D) can be both expensive and time consuming, with success of mechanization difficult to predict. Developing a viable mechanized harvest system often depends on breakthroughs in three areas: machinery, varieties, and agricultural practices. Results from all three lines of research may not emerge at the same time.

The mechanical harvesting of processing oranges, for example, appears to have stalled while growers wait for the de-

velopment of a complete mechanization *system* and not just a mechanical *harvester*. The mechanical harvester works well in the early part of the Florida processing orange season. But it cannot be used on late-season Valencia oranges, which account for 25-30 percent of Florida's total processing orange harvest. At harvest time, late-season Valencia orange trees contain both mature and immature fruit for the following season; mechanical harvesting removes too much of the following year's production. Researchers have developed an abscission compound that may complete the mechanization system for processing oranges and promote adoption of the mechanical harvester. The compound can be sprayed on trees to loosen the bond between the stem and the fruit on mature oranges, allowing mechanical harvesters to shake the canopy with less force and dislodge the mature fruit without harming the immature fruit. Before the compound can be used, however, the industry needs to obtain an experimental use permit from the U.S. Environmental Protection Agency.

The fresh produce industry is generally concentrated—the largest growers supply the majority of production. Depending on the type of machinery available, mechanization may accelerate the trend toward fewer and larger producers. For example, the mechanical harvester for processing oranges (a pair of machines powerful enough to shake the fruit off a tree) costs over a million dollars. Larger processing orange growers are the most likely to invest in expensive machines because a large, fixed investment can be spread over more acreage, making it more economical. An alternative to buying specialized machinery is custom harvesting, in which a third party buys machinery and harvests crops for multiple growers; a custom harvesting industry has developed for processing oranges. In other cases, harvesters may be available in a range of configurations appropriate for farmers of different sizes. For the baby leaf lettuce industry, large machines cost about $240,000 and cut 13,000-15,000 pounds an hour. At the other extreme, small mechanical harvesters pushed by workers cost about $10,000 and cut 300 pounds an hour. Regardless of the scale of machinery, once growers invest in specialized machinery for a particular crop, they may reduce the number of commodities produced on their farms.

Even if growers cannot reduce labor costs, other improvements can offset higher wages. Improved irrigation techniques, better pest control, higher yields, and the availability of new varieties can help increase profits. For example, between 1990-92 and 2005-07, U.S. strawberry yields increased 63 percent. Yields also increased for apples, asparagus, and lettuce.

Hand harvesting asparagus . . .

California Asparagus Commission

California Asparagus Commission

. . . field day to see a prototype asparagus harvester in action


Sutton Agricultural Enterprises, Inc.

Small-scale, hand-pushed mechanical harvester for baby leaf lettuce and spinach. . .

. . . and large-scale mechanical harvester


Ramsay Highlander, Inc.

In some cases, total production costs rise with labor wage rates. If there is no trade, rising costs generally lead to a lower quantity demanded, as production declines and prices increase. In today's relatively open international marketplace, it is hard for growers to pass on higher production costs if the same commodity can be imported for less during the same season. Some growers may shift production from labor-intensive crops to mechanized crops as labor costs rise. In some areas, selling farmland for housing is an attractive alternative. Many California growers, forced out of the asparagus business due to increased imports, have used both options.

Some production of labor-intensive crops may shift to countries with lower labor costs, but so far imports have seldom replaced U.S. production of *fresh-market* commodities during the season they are produced in the United States. There are more examples of *processed* fruit and vegetable production moving abroad. While labor rates may be less in other countries, total production costs are not necessarily lower. Imports are not always the result of lower labor or total production costs abroad. For example, the United States now imports small quantities of lettuce from Mexico. Total lettuce production costs in Arizona and central Mexico are similar; wages are lower in Mexico than in the United States, but so are yields. Changes in the U.S. lettuce market have created incentives to import lettuce. Bagged salads are frequently sold under annual or multiyear contracts that specify weekly quantities to be delivered. Some U.S. firms grow lettuce in Mexico to enable them to fulfill bagged-salad contracts in the event that bad weather or some other issue restricts the availability of U.S. lettuce, particularly during the winter months.

Growers Invest in Mechanization To Boost Competitiveness

Most of the fresh-market fruit and vegetable industry is competitive with foreign suppliers *despite* relatively high wage rates. However, the potential for immigration reform or changes in enforcement that might make labor availability more unpredictable or increase wages remains a concern. R&D is critical for developing new labor aids and mechanical harvesters that could help maintain economic competitiveness in a world economy. Individual growers, grower organizations, machinery manufacturers, universities, and the Government have all invested in these new technologies. Interest in R&D varies over time, particularly with respect to current and expected labor supply. Unfortunately, the success of mechanization R&D is unpredictable. The harvest of some commodities was mechanized much sooner than many observers expected. And, despite predictions, other industries still are not mechanized. Growers of some commodities need mechanization alternatives more urgently than others.

This article is drawn from . . .

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